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IN THE CLAIMS

The following are Claims 1-31.

1. (Original) An analog-to-digital converter comprising:

a waveguide adapted to receive an optical signal and an analog electrical signal, wherein the waveguide is adapted to provide a desired time delay to the optical signal based on a value of the analog electrical signal;

means for receiving the optical signal with the time delay and providing an output optical signal having a wavelength based on the time delay;

a demultiplexer adapted to route the output optical signal to one of a plurality of optical paths based on the wavelength;

photodetectors adapted to convert optical signals in the optical paths into electrical signals; and

a discriminating circuit adapted to receive the electrical signals and determine which of the optical paths provided the output optical signal to provide a digital electrical output signal corresponding to the analog electrical signal.

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2. (Original) The analog-to-digital converter of Claim 1, further comprising a fiber optic circulator adapted to provide the optical signal to the waveguide and the optical signal with the time delay to the receiving means.

3. (Original) The analog-to-digital converter of Claim 1, wherein the receiving means comprises:

a fiber assembly adapted to provide self-phase modulation and dispersion to the optical signal or to an optical clock signal; and

an optical switch adapted to receive the optical signal and the optical clock signal and provide the output optical signal.

4. (Original) The analog-to-digital converter of Claim 3, further comprising filters adapted to filter the optical signals in the optical paths.

5. (Original) The analog-to-digital converter of Claim 1, wherein the receiving means comprises:

dispersive elements adapted to impart a chirp onto the optical signal and an optical clock signal; and

an optical nonlinearity device adapted to receive the optical signal and the optical clock signal and to provide the output optical signal.

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6. (Original) The analog-to-digital converter of Claim 5, wherein the frequency of the optical signal and the optical clock signal are slewed at the same rate but in opposite directions, at the same rate and direction, or at a different rate but in the same direction.

7. (Original) The analog-to-digital converter of Claim 1, wherein the waveguide comprises a chirped distributed Bragg reflector.

8. (Original) The analog-to-digital converter of Claim 1, wherein the waveguide comprises at least one layer of an electro-optically active material having a refractive index controlled by the analog electrical signal.

9. (Original) A method of providing analog-to-digital conversion, the method comprising:

providing an optical signal pulse having a time delay controlled by an analog electrical signal;

converting the optical signal pulse with the time delay to an optical output signal pulse having a wavelength based on the time delay; and

providing a digital electrical output signal, corresponding to the wavelength of the optical output signal

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pulse, wherein a value of the digital electrical output signal is based on a value of the analog electrical signal.

10. (Original) The method of Claim 9, further comprising:

routing the optical output signal pulse to one of a plurality of paths based on the wavelength;

converting the optical output signal pulse to an electrical signal; and

determining the value of the digital electrical output signal based on which path provided the optical output signal pulse.

11. (Original) The method of Claim 10, further comprising filtering the optical output signal pulse.

12. (Original) The method of Claim 10, wherein the converting comprises providing self-phase modulation and dispersion to the optical signal pulse with the time delay.

13. (Original) An analog-to-digital converter system comprising:

an analog delay modulator adapted to receive an analog electrical signal and to provide optical pulses having time delays determined by the analog electrical signal;

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a fiber assembly adapted to receive the optical pulses or clock pulses and provide self-phase modulation and dispersion;

an optical switch, coupled to the fiber assembly, adapted to receive the optical pulses and the clock pulses and provide output optical pulses having wavelengths corresponding to the time delays; and

a discriminator adapted to receive the output optical pulses and provide digital electrical output signals based on the wavelengths.

14. (Original) The system of Claim 13, wherein values of the digital electrical output signals are based on values of the analog electrical signal.

15. (Original) The system of Claim 13, wherein the analog delay modulator comprises:

an optical pulse generator adapted to provide the optical pulses; and

a waveguide adapted to receive the optical pulses and the analog electrical signal and apply the time delays to the optical pulses under the control of the analog electrical signal.

16. (Original) The system of Claim 15, wherein the analog delay modulator further comprises a fiber optic

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circulator adapted to route the optical pulses to and from the waveguide.

17. (Original) The system of Claim 16, wherein the waveguide comprises a chirped distributed Bragg reflector.

18. (Original) The system of Claim 13, wherein the discriminator comprises:

a demultiplexer adapted to route the output optical pulses to one of a plurality of paths based on the wavelength;

photodetectors adapted to convert the output optical pulses to electrical signals; and

a discriminating circuit adapted to receive the electrical signals and provide the digital electrical output signals based on which path carried the corresponding output optical pulses.

19. (Original) The system of Claim 18, further comprising filters, coupled to the photodetectors, and adapted to filter the output optical pulses.

20. (Original) The system of Claim 13, wherein the demultiplexer comprises an arrayed-waveguide grating demultiplexer or a wavelength-independent star coupler.

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21. (Original) The system of Claim 13, wherein the discriminating circuit provides frequency shift keying detection.

22. (Original) The system of Claim 13, wherein the optical pulses are pulse position modulated optical signals.

23. (Currently Amended) An analog-to-digital converter comprising:

an optical pulse generator adapted to receive an analog electrical signal and provide optical pulses having time delays determined by the analog electrical signal; and

an optical pulse discriminator adapted to receive <u>each of</u> the optical pulses and provide a <u>corresponding</u> digital electrical signal, <u>wherein the optical pulse discriminator associates a wavelength to each of the optical pulses based on the corresponding time delay which is used to determine a value of the digital electrical signal, and</u> wherein the digital electrical signal is based on the analog electrical signal.

24. (Original) The analog-to-digital converter of Claim 23, wherein values of the digital electrical signal are digital representations of corresponding values of the analog electrical signal.

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25. (Original) The analog-to-digital converter of Claim 23, wherein the optical pulse generator comprises a waveguide adapted to receive the optical pulses and provide the time delays to the optical pulses under control of the analog electrical signal.

26. (Original) The analog-to-digital converter of Claim 25, wherein the waveguide comprises at least one layer of electro-optically active material having refractive index variations which form a chirped distributed Bragg reflector, wherein the analog electrical signal controls an index of refraction of the electro-optically active material.

27. (Original) The analog-to-digital converter of Claim 25 wherein the optical pulse generator further comprises a fiber optic circulator adapted to direct the optical pulses to and from the waveguide.

28. (Original) The analog-to-digital converter of Claim 23, wherein the optical pulse discriminator comprises:

a fiber assembly adapted to spectrally broaden and chirp the optical pulses or optical clock pulses;

an optical switch adapted to receive the optical pulses and the optical clock pulses, after the optical pulses or the optical clock pulses are spectrally broadened and chirped by the fiber assembly, and provide an optical output pulse

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corresponding to each of the optical pulses and having a wavelength based on the time delay of the optical pulse;

a demultiplexer adapted to direct each of the optical output pulses to one of a plurality of optical paths based on its wavelength;

photodetectors adapted to convert the optical output pulses to electrical output signals; and

a discriminating circuit adapted to receive each of the electrical output signals and provide the corresponding digital electrical signal.

29. (Currently Amended) The analog-to-digital converter of Claim 28, wherein the corresponding digital electrical signal for ~~each of~~ the electrical output signals is based on which of the optical paths carried the corresponding optical output pulse, wherein a value of the digital electrical signal is a digital representation of a corresponding value of the analog electrical signal.

30. (Original) The analog-to-digital converter of Claim 23, wherein the optical pulse discriminator comprises:

dispersive elements adapted to impart a chirp onto the optical pulses and optical clock pulses;

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an optical nonlinearity device adapted to receive the optical pulses and the optical clock pulses and provide an optical output pulse corresponding to each of the optical pulses and having a wavelength based on the time delay of the optical pulse;

a demultiplexer adapted to direct each of the optical output pulses to one of a plurality of optical paths based on its wavelength;

photodetectors adapted to convert the optical output pulses to electrical output signals; and

a discriminating circuit adapted to receive each of the electrical output signals and provide the corresponding digital electrical signal.

31. (Currently Amended) The analog-to-digital converter of Claim 30, wherein the corresponding digital electrical signal for ~~each of~~ the electrical output signals is based on which of the optical paths carried the corresponding optical output pulse, wherein a value of the digital electrical signal is a digital representation of a corresponding value of the analog electrical signal.

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